Geophysical Research Abstracts
Vol. 12, EGU2010-11705, 2010
EGU General Assembly 2010

The use of soil monitoring networks to detect changes in soil organic carbon content

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Process-based carbon dynamic models are widely used to estimate and forecast temporal changes in soil organic carbon content (SOC). Often, these models are calibrated against measurements from long-term field experiments with controlled treatments at a local scale. Repeated SOC inventories at the sites of a soil monitoring network may provide additional valuable information about temporal changes at a regional scale for a broader range of environmental conditions (land use, soil type, climate, etc.).
Recently, Saby et al. (2008) assessed the adequacy of European soil monitoring networks to detect changes in SOC. The minimum detectable changes (MDC) differed considerably among the networks, and the design turned out to be an important factor. However, Saby et al. derived their results from scenarios because the majority of the European monitoring networks performed only one sampling campaign so far. Data on SOC changes, gathered by repeated sampling at monitoring sites under controlled conditions including strict quality assurance protocols, are still rare, and little is known about random and systematic errors in the estimated changes. Furthermore, suitable (geo-) statistical procedures are required to extrapolate the SOC measurements and their change from the surveyed sites to the regional scale.
In our presentation, we report (i) our experiences on MDC gained by repeated SOC measurements at selected sites of the Swiss Soil Monitoring Network (NABO), and (ii) we show how the SOC measurements recorded at the sites of the soil monitoring network of Canton Fribourg can be used for a mapping SOC and its change at the regional scale. For this purpose we a use robust geostatistical kriging approach which exploits the dependence of SOC on land use, altitude and climate.

Saby P.A. et al. (2008). Will European soil-monitoring networks be able to detect changes in topsoil organic carbon content? Global Change Biology 14: 2432-2442.